REMARKS

The present invention is directed to a power cable particularly adapted for use in water and air-cooled welding torches. The assembly differs from prior art cables in that it includes a thin layer of flexible material that substantially encases the electrical conductor (*e.g.* cable) and a plurality of projections, preferably formed by the encasing layer, that extend radially therefrom so as to centrally position the cable within the outer flexible hose or conduit. By centering the conductor within the outer conduit, the projections define unobstructed fluid flow paths surrounding the conductor for the effective dissipation of the heat in the conductor. For water-cooled welding applications (Claims 1-10 and 21-24) the fluid flow paths are filled with water and the projections center the conduit so that there are no occlusions of the path enabling the flowing water to far more effectively cool the conductor. In air-cooled applications (Claims 11-20), the fluid flow paths convey inert shielding gas to the torch head about the stranded cable which picks up heat from the cable and cools the cable. Again, the projections hold the flow path opening by maintaining the cable in a centered disposition within the outer flexible conduit.

In prior art cable assemblies, the cable conductor is unsupported within the outer flexible conduit. As a result, the conductor will rest against portions of the inner surface of the outer conduit, occluding the cooling water or gas flow path about the conductor and causing uneven and less effective heat

dissipation. This is a constant occurrence as these cable assemblies are relatively long (typically 12.5-25 feet in length) so that the unsupported interior cable continually rests against the interior surface of the outer conduit. By providing more effective cooling, Applicant's cable assembly can employ a smaller diameter electrical cable, reducing the overall weight of the assembly.

In addition to enhanced cooling, Applicant's thin layer of encapsulating material, which itself preferably forms the cable supporting projections, has been found to enhance the current carrying capacity of the copper cable and prevents spraying and splintering of the cable which can occlude the cooling fluid flow passages therein. These benefits are also discussed in the application.

As will be shown, the cited prior art does not teach nor suggest the above described assembly. It should be noted, however, that notwithstanding the failing of the prior art to teach or suggest the inventive cable assembly, Applicant has amended the claims to recite that the layer of flexible material "substantially" encases the conductor as opposed to encasing the conductor. The reason for this Amendment is two-fold. First, the layer of flexible material may not encase the end portions of the conductors which are in electrical communication with the appropriate cable assembly fittings. Second, without such an Amendment, one could substantially encase the cable, obtain substantial benefits from the present invention and argue against literal infringement because of the gaps in the

encasement of the conductor. As will be apparent from the following discussion, such an Amendment does not at all effect the patentability of the claimed subject matter.

In the Office Action, the drawings were objected to because Figures 1-3 lacked proper cross-hatching. Presumably the Examiner intended to refer to Figures 2-4 as Figure 1 did not include any cross-hatching, nor did it include a sectional view which would require cross-hatching. With respect to Figures 2-4, it is respectfully submitted that the cross-hatching was indeed proper but may have been not clearly visible in view of the extremely small cross-sectional size of certain of the elements, *e.g.*, coating 36 and projections 38. Accordingly, new drawings have been submitted which more clearly show the cross-hatching of the projections 38 which extend outwardly from coating 36. The relative size of those elements relative to the cross-sectional size of the plastic or rubber hose 40 is such that it is difficult to clearly illustrate these cross-sections without substantially enlarging the individual drawings. It is believed, however, that with the definitive description set forth in the specification, the cross-hatching in the drawings should be sufficient. Additionally, the cable conductor 34 in Figures 3 and 4 and 104 in Figure 2 is shown as a plurality of dark dots in that that conductor is in fact formed of a plurality of individual wound or bundled wires forming the cable conductor. It is believed that the drawings are quite clear in that regard, however, if the Examiner continues to object to such a representation of the cross-section of a cable (bundled wires), it is

respectfully requested that the undersigned by contacted directly by telephone at (213) 896-2510 so that the matter could be discussed and the appropriate new drawings discussed. As indicated, however, it is believed that the drawings as shown and as discussed in the specification are quite clear as to what is represented therein.

The specification also was objected to in that the end of the Abstract included a reference to the function of one of the elements of the invention. The Examiner interpreted such language as being directed to the merits. Nevertheless, the language at issue has been deleted by the present Amendment as the disputed language is not believed to be critical to the Abstract.

In the claims, Claims 8 and 18 were objected to for failing to further limit the subject matter of a previous claim. This resulted from clerical errors in Claims 7 and 17 which have now been amended to depend from Claims 5 and 15 respectively thereby obviating the prior objections to Claims 8 and 18.

Claims 1, 3, 5, 11, 13 and 15 were rejected under 35 U.S.C. 102(b) as being anticipated by Iketani et al. (Patent No. 3,917,898). This position is respectfully traversed. It is believed that these claims were rejected based on a misunderstanding of the Iketani reference.

The cited Iketani patent discloses a flexible water-cooled cable in which water is directed into an annular spacing between the conductive metal cable (1) and the outer hose (6) through cooling passages (2) and (3) and an axial groove

(4) in a fitting or cable terminal (5) that is secured to the end portion of the cable conductor (1). While the great majority of the specification of the cited reference is directed to the composition of composite outer hose (6), the relevant portion of the reference is best seen in Figure 2 and described at col. 3, lines 6-10. As disclosed therein, the cooling water passes through the cable terminal (5) and about the conductor (1) within the outer hose (6) through channels (2) and (3) in the fitting and a groove (4) formed in a downstream end portion of the cable terminal (5). Figure 4 in the cited reference is a cross-sectional view taken through the downstream end of the fitting (assuming water flow from left to right in Figure 2). The remaining figures merely illustrate the different layers and rubber textures and characteristics found in the composite outer hose (6). Iketani does not identify, illustrate or even mention any form of support between the outer hose (6) and the conductive cable (1) other than that provided by the cable terminal (5) secured to the end of the conductor. Contrary to the contentions set forth in the Office Action, Iketani does not teach a layer of flexible material substantially encasing the conductor nor the claimed plurality of projections that extend radially from the encasing material to the outer hose layer.

The only radial projections disclosed in Iketani are in the electrically conductive cable terminal (5) that is secured to the end of the conductor cable. Between the ends of the conductive cable, there is simply no disclosure of any encasement of the conductor or any radial projections. It is the thin layer of flexible

material substantially encasing the conductor that enhances the current carrying capability of the conductive cable and prevents fraying and splintering of the cable as discussed in Applicant's specification. Encasing just the ends of the conduct would not obtain either result. It is the radial projections, preferably formed by the encapsulating layer, that continuously center the conductor within the outer hose layer to enhance the efficiency of the cooling water/gas flow. Providing radial projections just in the end fittings will not center the conductor within the outer conduit layer and thus will not form the unobstructed fluid flow conduits about the cable conductor. As noted above and discussed at length in the specification, without the spacing projections formed by the encasing material, the conductor cable rests against the outer flexible conduit which adversely impacts the cooling fluid flow and thus cooling efficiency of the cable. That would certainly be the case with the Iketani cable where the only support is provided at the ends of the cables where the cable terminals (5) actually grip the cable ends.

In summary, without the layer of flexible material at least substantially encasing the conductor and without the plurality of projections extending radially from the material, the cited reference cannot support the rejection under Section 102. Under that section, the cited reference must disclose all of the claimed elements. It clearly does not. Further, the recited reference cannot support a rejection, by itself, under Section 103 as there is absolutely no teaching or even suggestion of those elements. Encasing and spacing the ends of

the conductor cable in the manner of Iketani, simply provides the very prior art cable assembly structure which Applicant has sought to improve. Applicant substantially encases the length of the cable with a flexible material and spaces the encased cable from the outer hose material to obtain his improved results. Iketani does neither.

In addition to the rejection under Section 102, Claims 2, 4, 6-10, 12, 14 and 16-24 were rejected under Section 103(a) as being unpatentable over the previously cited Iketani reference in view of Madry. This position is also respectfully traversed. As noted above, the Iketani patent does not teach a layer of flexible material substantially encasing the conductor nor the plurality of projections extending radially from the encasing layer to the outer flexible conduit to form the fluid flow path as recited in the claims. These teachings are also not found in the cited Madry reference. While at first glance Madry may appear to project a similar structure to that of Applicant's, it does not.

The cited Madry patent teaches two embodiments of Madry's invention which are shown in Figures 1 and 2. Only the embodiment shown in Figure 2 utilizes a cooling flow and that flow is through a tube (7) formed in the center of his conduit. The areas designated 6 (in Figure 1) and 13 (in Figure 2) are air filled chambers that can additionally be filled with an insulating material. There is no teaching or suggestion that those chambers could be used to define fluid flow passages. Not only is there no such teaching or suggestion, it does not appear

that such a use of those chambers would even be possible. The outer portion of the Madry cable, identified by reference numerals (5) and (12) is described as a screen formed of a metallic material. If the outer layer were a "screen" as recited in Madry, that layer would be fluid permeable such that chambers (13) could not function as a cooling flow conduit. Such is certainly the normal use of the term screen. If, however, the layers were formed of a metallic water impermeable screen, the resulting outer metal tube would not be flexible and thus could not function as a power cable for use in welding which, of course, is the subject matter of Applicant's invention. While the figures in the drawings may appear at first glance to be somewhat similar to Applicant's cable assembly configuration, a closer review of the teachings of the German reference reveal that such is not the case. The device does not teach or suggest the claimed layer of flexible material that encases the inner conductor and forms projections so as to define a water or gas flow path extending along the conduit and surrounding the conductor.

Thus, the device taught by the German reference is indeed different from Applicant's construction and is also different from the structure disclosed in the cited Iketani reference. The combination of Madry with Iketani would not be obvious in view of these differences. If such a combination were made, the resultant structure would not comprise the claimed fluid flow path about the cable conductor as neither patent disclosure even suggests such a flow path. For all of these

reasons, the Iketani and Madry references, whether taken singularly or in combination fail to suggest the subject matter set forth in the claims.

It is respectfully requested that the Examiner reconsider his rejection based on the cited references in view of the above remarks. It is submitted that upon such a review it will be readily apparent that the cited references teach cable configurations which are quite different from Applicant's and do not teach or suggest the combination of elements recited in the claims.

Respectfully submitted,

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Dated: JAN. 12, 2005

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Amendments to the Drawings:

The attached drawings (Figures 2-4) replaces the original sheet including Figures 2-4. The attached drawings are submitted to more clearly show the cross-hatching in Figures 2-4.

Attachment: Replacement Sheet